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Agricultural Education.

AT one of the meetings of the Association of American Colleges and Experiment Stations a committee was appointed to examine Methods of Teaching Agriculture, and at the convention held in Washington last November the first report was submitted, and this has been published in full as circular No. 32 from the Office of Experiment Stations, in the Department of Agriculture. The first point to note is that a tabulation and summary of the replies sent from fifty agricultural colleges in response to letters of inquiry show that in this country, at least, there is nothing like a standard for instruction in agriculture. This does not mean simply that there are differences in the methods pursued in the various colleges which arise from different conditions; it means that there is no approach to anything like uniformity in courses of study or in the method of pursuing them. These colleges differ so widely in the topics taught, the order in which they are taken up, the time given to each one, and in the adjustment of the proportion of work in the class-room to practical work in the laboratory or on the farm, that it is almost impossible to compare one institution with another, or any of them, with a typical scheme for a regular course of three or four years. The committee, therefore, present their summary of data with the negative conclusion that they are not prepared to make any recommendation until more time has been taken to study and digest the facts presented. Indeed, the committee point out that the subject can hardly be discussed intelligently until there is a definite nomenclature in regard to the methods of agricultural teaching. The term "agricultural" is applied in a broad way not only to plant production, but to animal physiology, various special industries like dairying and sugar-making, to farm engineering and mechanics, to farm policy, including rural law, agricultural bookkeeping, etc. How the various subdivisions of the general subject are to be named the committee has not yet decided.

But, apart from the summary of data concerning our own colleges, there is an instructive series of observations upon the leading features of European institutions for agricultural education. From this we find that the systematic efforts to educate people in agriculture in Europe are much more complex than ours, ranging from elementary instruction in the public schools up to post-graduate courses for those who have already taken the university degree. Beginning at the bottom, in many European countries there are (1) farmers' meetings like our own farmers' institutes, held for a day or so, at which there is a lecture or two and a conference, (2) short courses of lectures on special topics and on the general subject of agriculture, (3) evening schools for elementary instruction, (4) classes in agriculture in public or private primary schools, (5) courses in the normal schools to train agricultural teachers for primary schools, (6) courses in agriculture in the secondary public or private schools for general education, (7) schools of a higher grade managed by individuals or corporations and subsidized by the Government, (8) schools of the same grade, but exclusively under the Government control, (9) institutions for higher education in agriculture only, (10) the same kind of institutions, but connected with universities, and lastly, departments in the universities themselves. The special thing which arrests attention is the relatively large place given to the higher, or what we should call post-graduate education in agricultural science. Opportunities are offered for thorough training in any or all the sciences as applied to agriculture. The result of this is that the experiment stations, the schools of agriculture and the agricultural departments of the Government never lack for well-trained investigators or teachers, and, besides this, industries like sugar-making, which require scientific knowledge of a high order, can always find skilled laborers.

This is the most important feature in the whole system. Improvements in education usually begin in institutions of the higher grades; good primary schools, at least, only flourish in conjunction with the best institutions of the highest grade. It is the colleges where teachers are educated, and the higher institutions of learning which furnish an educated public opinion that make good schools of a lower grade possible, and until we have institutions where a body of workers can be trained to agricultural research our whole system, from the primary instruction in agricultural science upward, will be structurally weak. Of course, as it is stated in this report, some of our workers and teachers can get their training in foreign schools, but, while this is better than no training at all, they acquire a certain alien habit of thought which is a bar to their highest success at home. In our own country the conspicuous improvements in agriculture have been made by investigators in scientific fields. Our marked advance in fruit-culture has been due to the discovery of methods for checking the ravages of insects and of fungous diseases. Great improvements in dairying have been made by the chemists in our experiment stations, and a more rational system of animal feeding, which has added millions of dollars to the value of our stock-raising interests, has come from the same source. It would seem, therefore, that one of our first efforts should be to raise the standard of our colleges of agriculture so that they may turn out a class of men who have a broad grasp of the entire subject and are capable of making original investigations in the various sciences which are connected with the general subject; and before students are capable of making the most of a really high-grade course in agriculture they must, beyond question, have a thorough college training in the principles of the various sciences which underlie agriculture.

At the other extreme of the educational system, that is, in the primary schools, the first necessity is competent teachers. How children may receive elementary instruction in ordinary schools is well set forth in the account of a visit to a school in Belgium which has a well-equipped teacher. At the time of this visit the teacher was giving a lesson on the properties and uses of milk to a class of boys and girls about twelve years old. By means of elementary chemical experiments and skillful questions, with samples

of milk and cream in their presence, and much material illustrating the composition and uses of the fluid, the teacher gave to his class a simple and clear explanation of such matters relating to the uses of milk and its composition as they could reasonably be expected to understand, and as the different members of the class summed up what they had listened to it was apparent that they were well taught and that from that time forth their knowledge of milk was considerably wider than it would have been if they had never received the lesson. The teacher had hung charts about the walls of his schoolroom, pictures of agricultural implements and of different plants, and adjoining his school was a small garden in which many kinds of plants were growing, and where different methods of cultivation were tried for the instruction of pupils. The teacher was not a mere book man. His schoolroom was close by the rooms of the village agricultural society, where there were collections of seeds, charts with the composition of different fertilizers, and many other things which would be of interest in the discussions of the society, and which were available for use in the school. He was secretary of this society. He had aided the farmers in fitting up a cöoperative dairy supplied with the most approved appliances for the creamery business, and by selecting, testing and purchasing fertilizers for them, and in many other ways. It was very plain that children trained under such circumstances would have a much broader outlook relating to agriculture, and be more inclined to avail themselves of advanced methods in agriculture than their fathers had been. Of course, it will be many years, if not generations, before we can hope for teachers of this sort in our country primary schools. Undoubtedly they are rare, too, in Europe, for only a beginning has been made in Germany, for example, to provide instruction in agriculture in normal schools.

We have no space to speak of the so-called secondary schools or schools of higher grade which are well provided with apparatus, collections of various sorts and material for illustration, nor of the institutions for higher agricultural education in many European countries. We can only say that it is not considered so important in these latter institutions that students shall learn definite things as that they shall acquire scientific methods of thought, and that the best educators are by no means certain that their systems cannot be largely improved. It will be a long time before we can have anything like systematic agricultural education either in common or high schools, and the most that we can hope is that by means of institutes and bulletins and the agricultural press the results of our experiment station work can be made directly useful to the farmers of the country, and that the character of this work can be made better and better. We cannot but feel, however, that an elementary knowledge of plant-growth and of other processes of nature will sometime be considered a natural part of the education of all boys and girls in the country, and this not simply because it will make them more successful farmers or fruit growers or truck raisers, but because as a matter of mental discipline it is an excellent schooling for anybody, helping to train the mind to habits of observation which can be used in any field of life, and giving a knowledge of facts and processes which will furnish pleasure and entertainment in all after life, even if it is not made directly profitable in work on the farm or the garden.

When a rock of any kind has lain for some time exposed to the weather, Nature finishes it in her own way. First, she takes wonderful pains about its forms, sculpturing it into exquisite variety of dent and dimple, and rounding or hollowing it into contours, which for fineness no human hand can follow; then she colors it; and every one of her touches of color, instead of being a powder mixed with oil, is a minute forest of living trees, glorious in strength and beauty and concealing wonders of structure.—*John Ruskin.*

Notes on the Eastern American Spruces.

IN the new *Illustrated Flora of the Northern United States and Canada*, by Dr. N. L. Britton and Hon. Addison Brown, the Black and Red Spruces are maintained as distinct species, but there seems to be an unfortunate and, perhaps, accidental confusion in the description and a transposition of the figures. These two Spruces and the White Spruce comprise the only species recognized in eastern North America. In many of the modern writings, whenever the Red Spruce has been recognized at all, it has been merely mentioned as a variety of the Black Spruce, and the characters which distinguish it have sometimes been very vague. In the last edition of Gray's *Manual* the variety is better characterized than in any of the earlier editions.

With our present knowledge of these trees they appear as distinct species, although it is true that individuals apparently more or less intermediate in their superficial characters are not unusual.

The late Dr. George Lawson, of Halifax, Nova Scotia, in a little paper on the Canadian Spruces, read before the Royal Society of Canada in 1887, and apparently privately printed, probably did more than anybody else to call attention to the differences between the species. This paper has been reprinted by Professor Penhallow in the *Canadian Record of Science* for July, 1896. It appears that the Black Spruce, generally known as Picea nigra, was first described in the eighth edition of Miller's *Gardeners' Dictionary* (1768) as Abies Mariana, "the Black Spruce Fir of North America, with very small cones," and although the description is not very specific it may stand for the Black Spruce as now recognized.

In New England and New York, and in the adjoining states to the south and west, this tree is less abundant than the Red Spruce, although it may be found in most regions in which the latter grows. The Black Spruce, however, is generally found in bogs, on the colder boggy lands, around the shores of lakes, or wet places on hills and mountains; the Red Spruce, on the other hand, being found on the better-drained or warmer lands, whether in valleys or mountain slopes. In many localities the two species may be found intermixed or close side by side, and in some places the Black, Red and White Spruces may be found together, as, for instance, at Kineo, at Moosehead Lake, in Maine. Under favorable conditions the Black Spruce may become a tall slender tree, but in its best development it is smaller in size of tree, limb, twig and cone than the Red Spruce. Growing in open places it may be furnished with branches to the ground, but the branches are generally shorter, more slender and therefore more drooping, than than those of the Red Spruce. The branches are less regular in their growth—that is, they are not so uniformly graded in length from base to summit—which often gives the tree a straggly appearance and less of the regular conical aspect of the Red Spruce. As a rule they are much depressed instead of horizontal. The twigs are pubescent, with fine rusty brown hair or occasionally nearly glabrous, and are generally of a darker, duller red-brown color than those of the Red Spruce; and they are commonly more slender, the lateral ones becoming depressed or pendent.

The leaves generally seem shorter and less pointed than those of the Red Spruce, and they stand more erect or brush-like on the twigs. The distinctly dark blue-green or glaucous color of the foliage at once distinguishes it from the Red Spruce and gives it more of the aspect of the White Spruce, with which it has occasionally been confounded. On the tops of the trees or on the fruiting branches the leaves are often shorter and blunter than on the lower or non-fruiting branches.

In cold, wet, spongy, sphagnous bogs, where there is no real soil and the sphagnum sinks below water-level when trodden upon, the trees may be found bearing cones when less than three feet high and with stems less than an inch in diameter. Such diminutive trees may be many years old, scores of years old in fact, and are to be found in

their peculiar situations in Maine, New Brunswick and other parts of Canada, where they are often known as Water Spruce. On the firm ground adjoining such bogs the same species of tree grows to normal size.

The cones of the Black Spruce often seem clustered together in bunches, and they usually remain on the trees for several years after they are mature. Sometimes cones of the different seasons for the past twenty or thirty years may be found still persisting on the older trees, generally on the inner ends of the branches near the trunks. The mature cones, which are attached to the twigs by short, stout, recurved stalks, are generally ovate in form and have been well described as plum-shaped. When open they often appear nearly globular in outline. They average nearly an inch in length, but are often much less, and are occasionally as much as an inch and a half long. When young they are of a rosy purple or dark purplish color, changing with age until they are of a duller or more gray-brown color than those of the Red Spruce when both arrive at maturity and the cones open. The scales are rigid, are very thin and often pale-colored at the outer ends, which are sometimes quite narrow, and where they also often seem wrinkled, and the edges are quite distinctly uneven, eroded or notched. The cones do not open so freely as those of the Red Spruce and the scales do not allow the seeds to drop out easily or soon. The Black Spruce is the Muskeag Spruce, described and illustrated from a photograph, by Mr. H. B. Ayers, on pages 504 and 505 of the seventh volume of GARDEN AND FOREST.

The Red Spruce (now known as Picea rubra, and hitherto most frequently called a variety of P. nigra or P. Mariana, as it is now proposed to call P. nigra) is the principal Spruce timber-tree throughout the maritime provinces and eastern Canada, throughout Maine and the other New England states, New York and Pennsylvania, and extends farther south and west. Under most favorable conditions, as in the Adirondack forests in New York, it may attain a height of considerably over one hundred feet and a diameter of trunk of over three feet, although the average size as cut for timber is much less. A count of the annual rings shows the older trees to be more than two hundred and occasionally three or four hundred years old. Interesting tables of heights, diameters, age, etc., of a large number of specimens cut in the Adirondack forest, and excellent photographs, may be found in the Report of the New York State Forest Commission for 1894, where the monograph by Mr. W. F. Fox on the Black Spruce refers to the Red Spruce as now understood, and which is also locally known as Yellow Spruce. On high mountains, at the limit of tree growth, the Red Spruce may be reduced to a low plant scarcely rising above the shelter of the rocks. Growing in the woods the Red Spruce becomes a tall, straight tree without living branches, except on the upper part; in open places it may grow up symmetrical in form and covered with nearly horizontal branches to the ground. The general color of the foliage is dark yellowish green, varying to dark green, in this respect resembling the commonly planted Norway Spruce or the Oriental Spruce, Picea orientalis, more than any of our native species. The leaves are either straight, or nearly so, or more commonly decidedly curved or bent and appressed toward the tips of the twigs. The small twigs average stouter than those of the Black Spruce under similar conditions, and they are not so inclined to droop or be so pendulous. The bark of these young twigs is of a brighter reddish brown color and is more or less densely covered with minute brown hairs.

The ripe cones, before opening, are oblong or oblong-oval in form, the middle, or the upper half stoutest, and tapering to the apex from near the middle, instead of being slender and nearly cylindrical, as are the cones of the White Spruce, or plum-shaped or ovate like those of the Black Spruce, and they have very short curved stalks, shorter than those of the Black Spruce. They seem to be borne nearer the tips of the branches than the cones of the Black Spruce, and rarely persist on the trees longer than the second summer. On different trees the cones may vary from an inch or an inch and a quarter, to two or occasionally nearly two and a half inches in length. They may be green or purplish in the growing condition, but as they become ripe and dry and the scales separate they lose their purplish aspect and change to a bright reddish brown color. The scales at the apex are broad, rounded or rarely obscurely pointed, and they are quite firm and rigid, and have edges entire or only minutely eroded or notched.

Lambert, in his monograph of the genus Pinus, published in 1803, appears to have given the first unmistakable figure of the Red Spruce, accompanied by a description which is relatively not so good as the figure. To this species, in accordance with the generic classification of the time, Lambert gave the name of Pinus rubra, which was afterward placed in the genus Picea. As Miller, in his *Gardeners' Dictionary* (eighth edition, 1768), previously used the name Pinus rubra, and seems to have applied it to Pinus sylvestris, the Scotch Pine, it is likely that our Red Spruce is to be burdened with another name to conform to rules adopted by some of our botanists. It may be that the name Picea Canadensis, applied to the next species by Dr. Britton, rightfully belongs to the Red Spruce. If the name Picea rubra must be done away with, and if the name P. Canadensis cannot be applied to this species, perhaps botanists may see the propriety of taking up Muenchhausen's name (Pinus Abies acutissima; *Der Hausvater*, vol. v., p. 225, 1770) if it is conceded that he was describing the Red Spruce. The species would then become Picea acutissima, a name much less appropriate than the one by which it is now known. Muenchhausen describes the tree as having reddish bark, but otherwise much like the Black Spruce, of which he also considered the Red and White Spruces as possible varieties. He gives as English names of the Red Spruce, "The Red Spruce Firr, or small-coned Virginia Firr, the new Scotia Firr with oblong cones."

The third Spruce of eastern America is the White Spruce, Picea alba of most botanies, and which may be changed to P. laxa if the name P. Canadensis does not surely belong to this species. It is locally known in New England as the Bog Spruce, Cat Spruce and Skunk Spruce. The last two names have been given on account of the strong peculiar odor of the foliage when rubbed or bruised, or which, in certain states of the atmosphere, may be detected at some distance from the trees. This species is native only in the northern United States and in Canada, extending from the Atlantic coast far westward.

Dr. Britton, in the *Catalogue of Plants growing within one hundred miles of New York City*, published in 1888, and in his new *Flora*, has fastened Miller's earlier specific name of Canadensis (Abies Canadensis, *Gardeners' Dictionary*, eighth edition, 1768) to this species; but, except for the fact that Miller calls it the "Newfoundland White Spruce Fir," there seems to be no more authority for applying Miller's name to the White Spruce than to the Red Spruce. Indeed, the brief description might apply to either species. Moreover, Miller, who did not recognize the Red Spruce as such, also says that his species is used indifferently with the Black Spruce in the manufacture of spruce beer. Now, it is well known that the White Spruce, on account of the strong disagreeable odor already mentioned and the equally unpalatable flavor, is never used in making spruce beer. As what is called White Spruce in many English collections to-day proves to be our Red Spruce, there is good reason to believe that Miller had the latter before him when he wrote his description. In addition to his description he gives a figure of the species in his *Figures of Plants*, published in 1771 (vol. i., plate 1), and, although very poor, this certainly bears more resemblance to the Black or Red than it does to the White Spruce. In this volume, page 1, he says, "the leaves of the Black sort are whiter on their under side than those of the White," and also that "the White is always found growing naturally on the mountains, and the Black upon the low grounds, generally in bogs or swamps. The first is by much the largest tree." These comparisons are

quite applicable to the Red and Black Spruces, and his further statement that "the cones of these trees were sent from Virginia by Mr. Banister toward the end of the last century," points to the Red Spruce, for he would hardly have obtained the White Spruce from the region indicated, even allowing for the very large and indefinite Virginia of those early days.

The evidence attainable certainly seems to show that the name Picea Canadensis should be transferred to the Red Spruce, and that the White Spruce should be called P. laxa, as proposed by Professor Sargent (Garden and Forest, ii., 496.).

Besides its peculiar odor and flavor, the White Spruce is distinguished from the Red by its distinctly glaucous or dusty-looking foliage and by having leaves longer and generally more pointed than either the Black or Red Spruces. The twigs are stout and rigid, pale greenish white, and are glabrous or without the hairs which are found on the other two species. The mature cones on different trees may vary from an inch and a quarter to two inches and a half or more in length. They are slender and more or less cylindrical or finger-shaped, green while growing and pale brown when ripe and dry. They appear sessile on the tips of short twigs and ripen early in the autumn, when the scales separate and allow the seeds to escape. The scales are quite broad, and are either rounded or truncate, or even slightly retuse at the apex. They are smooth, and the edges are entire and not notched or eroded, although some of the scales are occasionally split down the middle of the outer end. They are very thin and pliant, and the whole open cone is easily crushed in the hand, unlike the scales of the cone of either the Red or Black Spruce, which are firm and rigid and not easily crushed down after the cone is dry and open.

Growing in open places the White Spruce becomes a large tree of symmetrical conical form with horizontal branches from base to top. As in the case of the Colorado Blue Spruce, the glaucous or "blue" character of the foliage may vary considerably in different individuals, some trees showing it in much greater degree than others. Rarely, specimens of the Red Spruce may be found having a slight glaucous hue. The leaves of all the species vary greatly in length, thickness and sharpness of their points according to the part of the tree upon which they grow, to environment, to the age of the trees and to other conditions.

The winter buds of the White Spruce are usually of a lighter brown color than those of either the Black or Red Spruces, and are larger and composed of broader scales, which are generally loose or flaring at the tips, while those of the other two species are much darker-colored, are smaller, and have narrower, more closely appressed scales, so that their buds are more conical or pointed.

While the specific differences are so confusing in the early as well as some of the later literature on the Spruces, the three species are well figured in the first volume of Lambert's splendid monograph, which was published in 1803. Plate 28 shows the Red Spruce, which was figured from specimens grown in England at that time, but on the same plate are two "ripe cones imported from America by Mr. Loddige," which seem much like those of the White Spruce. The three species are also well represented in the *Pinetum Woburnense*, published by Forbes in 1839.

Arnold Arboretum. *J. G. Jack.*

New or Little-known Plants.

Aster junceus, Ait.

THOUGH a rare plant in the United States, Aster junceus has been better understood than the related A. longifolius, which was discussed in a recent number of this journal (vol. ix., p. 507). In 1841 Torrey and Gray gave to a discussion of this species, then treated under A. laxifolius, Nees, a full page of their *Flora of North America*, and to-day, with additional material at hand, there is little to add to their characterization of the plant.

Like Aster longifolius, this species is of northern range, but it extends farther south, to central New York, Ohio, Michigan, Wisconsin and the Black Hills of South Dakota. It is generally found in sphagnous swamps or on gravelly shores, though it sometimes grows on drier soil. From a large number of herbarium labels it would seem that A. junceus has a remarkable period of bloom, from late June to early September, a habit which was long kept in mind by the name æstivus, applied to this plant.

Aster junceus is ordinarily a well-marked species. The smooth or slightly pubescent, or even roughish, stems are very slender, growing from one-half to three feet high. The thickest leaves are linear or elongate-lanceolate, attenuate to the tip, but hardly narrowed below to the sessile base; the cauline are from two to six inches long and from one and a half to four lines broad; the floral are much reduced. The leaves are, further, quite entire, or sometimes a little serrulate, the margins generally being recurved and strongly ciliate-scabrous. As in A. longifolius, the branches of the inflorescence vary in length; the heads may be few or solitary on the short branches, or loosely paniculate at the ends of the slender, almost naked branches. The heads are about three-quarters of an inch across. The involucre is three or four lines high, of about three series of slightly imbricated, erect, linear or linear-lanceolate bracts with acute or attenuate herbaceous tips. The rays vary in color from white through pink and crimson to deep violet-blue, but commonly they are pink or crimson.

Though Aster junceus approaches A. longifolius in some of its forms, it can generally be recognized by its lower and more slender habit, narrower, thickish and scabrous leaves, and by the shorter imbricated involucre with no enlarged outer foliaceous bracts.

Mr. Faxon's drawing (see fig. 9, p. 65) was made from a specimen collected at Fort Fairfield, Maine, where, in early September, with the dim purple spires of Prenanthes racemosa, the creamy white stars of Parnassia and the golden-yellow masses of the shrubby Cinquefoil, this Aster makes of the gravelly intervales of the Aroostook River a garden of delights for all botanists who have found their way to that favored region.

Gray Herbarium, Cambridge. *Merritt L. Fernald.*

Ipomœa Briggsii.

THIS plant, introduced a year or two ago, has proved a first-class winter-blooming climber, but so far, in this neighborhood at least, it has resisted all efforts to induce it to bloom out-of-doors during the summer. This failure to show summer flowers is not to be regretted very much since it does so much to brighten up the conservatory during the dull season. Last spring I planted several good-sized tubers out-of-doors in company with other tuberous sorts. Ipomœa Briggsii made splendid growth, but no appearance of bloom; about the beginning of October the tubers were carefully lifted and put in pots, some of the branches which had got mutilated in the operation were removed, or where these were too numerous for the roots to carry over after potting they were thinned out a little. A sunny position was given to the plants in the Begonia-house, where in a few days the shortened growths freshened up. A few new shoots started out, and then from the axils of the leaves the flower-buds began to show. It is now three months since the first flowers opened, and several flowers have expanded on each plant every day since. Unlike our summer-blooming Ipomœas, which close their flowers early in the day, those of I. Briggsii remain open all day long.

This species resembles Ipomœa Horsfalliæ to a certain extent. Its flowers, however, are smaller, and their color may be called a rich magenta crimson. Next season I intend

Fig. 9.—Aster junceus, Ait.—See page 64.

to grow it in large pots plunged out-of-doors, so that the plants can be removed to the greenhouse without having to cut any of the branches. Cuttings of the ripe wood root much more readily than those of I. Horsfalliæ.

Botanic Garden, Washington, D. C. *G. W. Oliver.*

Cultural Department.

Propagating Plants by Cuttings.

THE propagation of plants by means of cuttings or slips is the simplest and best known. Almost all plants can be multiplied in this way when properly treated at the right time.

In any special instance one ought to know the conditions under which the plants exist, especially as to temperature; and the season of active growth, for this is generally the best time to start the cuttings or slips, especially of the so-called soft-wooded plants. There are some exceptions among hard-wooded plants, which seem to need a longer period of preparation or callousing. We can strike cuttings almost any time from the growing shoots of Roses, but slips of ripened wood must be treated as we treat Grapevines and Currant prunings, by putting them in sand in cold frames or cellars to callous over winter. A large number of hardy shrubs can be propagated in this way, and we get larger plants in less time than when we use the soft growth. Whenever soft tips fail to root it will be well to try ripened wood in the way suggested.

Soft-wooded plants are propagated mostly during wintertime. In many large establishments only poor provision is made for propagating. It is not at all uncommon to see cuttings standing in pots on ordinary greenhouse benches, under adverse conditions, making a struggle to gain a root-hold. No greenhouse should be without a corner properly fitted for rooting plants. This can easily be done. In the majority of places, the benches are of wood or slate slabs, and if we would enclose a section of a bench by boarding up the under part we could get sufficient warmth even for tropical plants. Slides will be required to regulate the temperature. Our benches being of concrete we could not adopt this arrangement, and in such cases the best plan is to tap the heating system and carry a coil of three-quarter-inch pipes above, so that they rest on the table. These pipes must be boarded over so as to enclose an evenly heated air-space, which in turn evenly heats the bed of propagating sand above it. This is better, of course, than to run the pipes directly through the bed. Above this platform a part of the bench boxed in holds some four inches of sand. The box may be finished neatly or spanned by sheets of glass, movable as occasion requires. By a valve arrangement we are able to regulate the amount of bottom-heat to a nicety. In selecting a corner one should choose the shadiest and, if possible, the coolest place. Practical experience has shown that successful propagation requires that the temperature of the air should be about ten degrees lower than that of the soil or sand in which the roots form. A cool house enables us to make these conditions better than a warm one. A bottom-heat of sixty-five degrees, Fahrenheit, with an overhead temperature of fifty-five degrees, will suit all but a few tropical plants. The object should always be to develop as many roots as we can with as little excitement as possible of stem and leaf growth. A soft, spindling growth is least desired, but always results when we use a close, stuffy propagating bed.

Medium sand, neither coarse nor soft, is best. I avoid red sand. For winter and spring work we like our sand as free from clayey or loamy ingredients as possible, though for summer use a slight percentage is advantageous. It should be packed firmly.

In the preparation of cuttings the old practitioners used to hamper their work by much detail. It was not supposed that a cutting could root unless taken off at a joint, and even to-day some growers are possessed by the same delusion. Special care is needed with some kinds of plants. Cuttings must be selected and be at just the proper condition of ripeness, but with the majority of the plants propagated cuttings made of sturdy growing shoots are almost sure to root, no matter where we cut them. All that is necessary is to see that they are properly inserted, and with as little delay as possible. They should be cut clean, shorn of a few of the bottom leaves and made firm in the sand. Abundance of water must at once be given and the bed well shaded, for on no account must the cuttings be allowed to wilt.

Of soft-wooded plants it will suffice to mention a few which require special preparation or to be in a certain condition of ripeness. Growing side-shoots of Ficus elastica, taken with a heel, root more quickly than the tips. It is possible, also, to root separate eyes of these, but it takes a very strong bottom-heat of eighty degrees to start them into growth even when rooted. Daphne Indica, Cytisus, Azaleas and Acacias root best from half-ripened shoots taken with a heel. To propagate these in quantity it is a good plan to prune an old plant closely and take the fresh shoots as they come from the older wood. Euphorbia (Poinsettia) pulcherrima and E. fulgens root best from soft shoots, also taken with a heel. Old plants of these kept in a dormant condition until the opening of spring, and then planted out when settled weather comes, furnish abundance of cuttings all through the summer, and from these we get a lot of various sizes. Dracænas of the Cordyline section seldom fail to root when the tips are taken as well as by division of the stem and root.

Wellesley, Mass. *T. D. Hatfield.*

Greenhouses for Amateur Gardeners.

THIS is the season of the year when plants commence to grow more naturally and force more readily in the greenhouse. It seems to be also the time when one's less provident gardening friends drop in on their annual visit to take measurements and talk over building that long-delayed greenhouse, and it is a good time to talk over the matter from the amateur point of view. No two persons garden in the same way and with similar ideas, but no one can garden seriously for any considerable time in this climate without feeling the need of shelter of some kind for his plants, many of which are safe out-of-doors for only half the year. Even those of us who are specially devoted to the cultivation of hardy plants, find that as our collections grow we need shelter for plants whose hardiness is uncertain, or for those which are to be planted out, but have been received out of season. One can possibly garden successfully with cold frames in a hardy-plant garden, but they are anything but pleasant things to care for during the stormy days of winter. Besides, one's garden fever seldom reaches an ebb where flowers are not acceptable, and in the pursuit of these and of comfort we naturally gravitate toward a greenhouse or a desire for one. Unfortunately, it is too often a desire, for, curiously enough, there seems to be a general idea that a greenhouse is a luxury, expensive to build and expensive to maintain. This is one of those popular fallacies which keep afloat mostly because no one takes the trouble to deny them, and perhaps because the horticultural builders have not recognized the fact that there is a very large want of small greenhouses at a moderate price. Such greenhouses are offered abroad for much less than half the prices quoted here, and heaters in great variety at prices which evidently have some relation to the cost of production. It will be a great boon to horticulture when the builders wake up to modern business methods and offer out of stock a choice of a few styles of small greenhouses at a fair price, suitable for modest gardens. At present, however, one does not need to debar himself if he is willing to take some trouble. By visiting the owner of some small house one can get some measurements and sketch out his special requirements. The lumber for the double-board walls is of small expense at the nearest lumber-yard. The sash-bars can be ordered of those dealers who make them a specialty, and the ventilating sash can be had of some dealers. Any carpenter can soon frame the structure ready for the glass, and, in fact, the whole thing is not beyond the skill of any one handy with tools. Seventy-five to a hundred dollars' worth of materials will suffice for a house large enough for most small gardens, and another fifty dollars should put in a water circulation, which is the best and most economical method of heating. It is difficult to advise on the form of the greenhouse most likely to prove satisfactory; it will depend very much on the species of plants grown. Of course, the cheapest form is a span-roof over wooden walls, as it is the easiest and quickest built. The modest structure which answers my requirements is an evolution from this form, and may be suggestive to any one who is likely to grow almost anything except strictly tropical plants, and who wishes also to store plants which must be kept cool and dormant. Originally I had a house about eight feet wide with side benches, with heater at one end and pipes under the benches. Outside of the house to the south was a row of cold frames. It was borne in on me after some experience that covering and uncovering cold frames was not a specially pleasing occupation, and I had rather too much heat in the house. I then raised the sash, sloping it from the ridge to the front of the cold frame, and by digging a walk just outside the former wall of the house, but now under glass, I have access to the beds of the former cold frame, and can work over them at any time in perfect comfort. This annex is ordinarily ten to fifteen degrees cooler than the main house. At the furthest end plants remain nearly dormant, and in other places there is warmth enough to bring plants and bulbs on gradually as may be desired. Later I took out the cube of earth under the south bench and removed the lower part of the former south wall, adapting it to a fernery. At present, with a house fifteen feet wide, I have now fifteen feet width of benches and solid beds and two paths. A further improvement would be to carry the north wall up three feet so as to make room for shelves which would hold more pots. But the most satisfactory addition ever made to the house was a coat of emerald-green, which painted it quite effectually out of the landscape. There does not seem to be any special reason why such a utilitarian structure as a greenhouse should be made specially prominent by the whitest of paint. Small greenhouses and commercial places cannot be made very effective show places, but it does seem

as if there might be a reform in private establishments conducted on a liberal scale, where usually the machinery of pipes, benches and pots is more prominent than the plants. It would seem that such places would vie with each other more in producing effective ensembles than in the production of crops.

Elizabeth, N. J. *J. N. Gerard.*

Notes from the Botanic Garden of Smith College.

THE vigor and luxuriance of the Palms and other tropical plants in the Palm-house here seem to prove that the planting-out system is the best for making fine specimens in a short time, and we agree with Mr. Watson who, in a recent letter to GARDEN AND FOREST, says "that he would rather enjoy a healthy specimen for two years than put up with a miserable, half-starved scrag of a plant for twenty." The bed in the Palm-house here is forty feet long by twenty wide and five feet in depth; three feet below the path and two above. Underneath the bed is one and a half feet of broken bricks for drainage, and draining pipes pass through these. The soil is a sandy loam, being the top soil from the site where the greenhouses now stand, with two cords of rotted stable-manure and five hundred pounds of ground bone incorporated. The bed is raised two feet above the path, so that it will be warmer than it would be if kept on a level. The sides of the bed are kept up by rock-work with a gentle slope in to the bed. The pockets in the rock-work are planted with some thirty-five species of Ferns and Selaginellas, several of a kind, a few varieties of Rex Begonias and Ficus repens. Considering the heavy spraying they have been subjected to while spraying the large plants in the bed, the following list of Ferns and Selaginellas have done exceptionally well: Doodia aspera, Nephrodium hertipes, Asplenium biforme, A. bulbiferum, Nephrolepis exaltata, N. Phillipinense, N. cordifolia, Davallia Fijiensis, var. plumosa, D. Fijiensis, var. majus, Pteris palmata, P. serrulata, P. Sieboldi, Polypodium aureum, Aspidium falcatum, Lastrea opaca, Doryopteris nobilis, Gymnogramma sulphurea, Adiantum caudatum, and in open places Lomaria gibba and L. ciliata, Selaginellas Kraussiana and Martensi, the latter being especially well suited for this purpose. Many of the other Ferns planted have done well, but are not as thoroughly suited for the purpose as those in the list given. In addition, many Ferns have sown themselves from spores probably blown in from the adjoining house, and some of the native Selaginella Apus, with Mosses and Liverworts, came up spontaneously. These, with the Rex Begonias and Ficus, have almost hidden the rocks from view, and make a beautiful and much admired edging for the bed.

We have in the house some twenty-eight species of Palms, representing, as far as we have been able to get them, types of the different sections of this family, though not more than eight are planted in the permanent bed. Besides these eight Palms the bed contains three Tree Ferns of different species, namely, Alsophila australis, A. excelsa and Dicksonia antarctica; one Ficus religiosus and F. elastica, a large specimen Codiæum, var. Queen Victoria, Caffea Arabica, Ravenala Madagascariensis or Traveler's Tree, Bambusa arundinacea, Dracæna fragans, D. australis, a fine specimen of Cyanophyllum magnificum with leaves thirty-two inches long and seventeen wide, a clump of Hedychium Gardnerianum, and one Monstera deliciosa. For undergrowth we have planted, nearer the outer edge, clumps of Calathea zebrina, three species of Philodendrons, some of the large-leaved Begonias, such as B. ricinifolia, B. Verschaffelti, Curculigo recurvata, clumps of Aspidistra lurida and Peperomia arifolia, which make fine plants planted out, also several varieties of Codiæums, while in the centre among the Palms are some of the commoner species of Ferns and plants of Sanchezia nobilis, which do remarkably well used in this way. Three species of Musa have been planted so as to give the house at once a tropical effect. These will be removed as soon as the Palms attain a large size. Musa Chinensis is just now in fruit, the cluster containing about one hundred well-developed bananas, not quite ripe. This bed was planted toward the end of April last year, and I feel perfectly safe in saying that almost every plant has more than doubled its size.

On the side-tables, in addition to the young Palms already mentioned, are a small collection of Bromeliads and collections of ornamental-leaved tropical plants, flowering tropical plants, economic plants and plants of purely scientific interest. In baskets suspended from the roof are several species of Nepenthes.

The modern iron-framed greenhouses are excellent, but they have some disadvantages. Since the space under the side-tables is all taken up by the hot-water pipes we have no opportunity for planting climbers, which add so much to the beauty of a house. Every experienced gardener knows how much better his ornamental climbing plants will grow when they can be planted out under the side-tables than when confined in pots or tubs. To overcome this difficulty we have planted them in boxes six feet long by two wide and one foot deep. These are painted an inconspicuous color and stand on the side-tables. The vines were planted last July and all have made good growth and some have flowered profusely. We have Allamanda grandiflora, Bougainvillea glabra, Clerodendron Thompsonæ, Aristolochia elegans, A. Duchardii, Bignonia speciosa, B. Chamberlaini, Thunbergia Harrisii and Passiflora Pfordti, with space left for rarer species when they can be secured. All the vines are trained on horizontal wires placed about sixteen inches from the glass, to avoid any possibility of freezing.

Botanic Garden, Northampton, Mass. *Edward J. Canning.*

Water-lilies.

How to Winter Them.—Keeping Water-lilies through the winter is considered by many more difficult than growing them and producing first-rate flowers, but, as with many other plants, the more experience one has with the different varieties and their peculiarities the more simple their cultivation becomes. Of tropical or tender Nymphæas, medium to small tubers are the best to carry over winter, but it sometimes happens that it is desirable to retain a certain plant or variety that has made extra-large growth during the summer. I had several such last season, and by way of experiment I tried a new method of wintering. After the frost had cut off the foliage I awaited a mild spell, and then with a spade dug around the plant; I gave it a root-pruning, taking care to keep outside of the tubers, so as not to cut them; then with a spade on either side lifted the stool intact. This was again planted in the soil, which is sandy, under the bench in the greenhouse, and thoroughly soaked to settle the soil. After a few days the roots were much decayed, and another soaking of water was given to settle the soil around the old crown and attached tubers. In this condition they were left, and on examination at this date, February 2d, the tubers were in excellent condition and will remain so for a long time. Even the hardy varieties treated in this way are keeping better than I had expected. This treatment is not so well adapted to large plants of the Stellata type, as they do not form side-shoots and tubers. The best method for carrying these over winter is to keep them growing. These, though very large, were severely root-pruned, the largest leaves taken off, and potted into as small a pot as would hold them, which was ten inches. The plants have kept growing slowly, and are now fine and healthy with flower-buds. The water has been at a temperature of from sixty to sixty-five degrees, which is the temperature of the house.

Winter-flowering Aquatics.—Such varieties as Nymphæa stellata, N. Zanzibarensis and N. pulcherrima have been in bloom all winter. The latter variety is the best of any of the blue forms. The flowers open quite early in the morning, and remain open until late in the afternoon, whereas those of N. Zanzibarensis seldom, if ever, open until noon or shortly before. Little can be expected in the line of Water-lily flowers during December and January, but N. delicatissima and a seedling much like N. Smithiana have not failed to produce flowers of good size and substance. N. O'Marana has proved a disappointment. It was hardly recognizable as the plant which I saw in such good form, condition and color out-of-doors last summer. N. Devoniensis and N. rubra are better.

Aponogeton distachyon proves a first-rate winter-flowering plant. It enjoys a temperature of fifty to sixty degrees, and blooms freely all through the dull, sunless days. The flowers are sweet-scented, resembling hawthorn, and are good for cutting.

Seed Sowing.—We have decided to raise some Water-lilies from seed, and as it takes between three and four months to grow a flowering plant from the seed, the sowing must be done at once, of both hardy and tender varieties. Four or five inch pots should be used for the purpose and sandy loam. If the latter has lain some time and had manure composted with it so much the better, and fresh manure should not be used. The seed should be covered lightly after it is sown and the pots stood in water until the seed is thoroughly soaked. The pots should be submerged so that the tops are two inches below the water. Attention to this particular is necessary, or the seed will not germinate. The temperature of the water should be from seventy-five to eighty degrees. Victoria regia

seed may be sown now, but the temperature of the water must be eighty-five to ninety degrees, and from twenty to thirty days is required for germination. The young seedlings should be transplanted at an early stage and kept steadily growing. They must be repotted singly before they are weakened by overcrowding and by starving conditions.

Riverton, N. J. *W. Tricker.*

Cypripedium Morrisianum.—This is a distinct and pretty hybrid, the result of a cross between Cypripedium Harrisianum and C. Leeanum giganteum, one of the finest and largest flowered forms of C. Leeanum in cultivation. The bloom is brilliantly colored, of excellent shape and substance, the dorsal sepal measuring over two and a half inches across, quite flat, with a broad white margin, faintly suffused with rose, the base of which is deep bronzy purple, having numerous lines of a lighter shade emanating from the base, which are profusely marked with minute purple spots. The inferior sepal is a clear pea-green, with several lines of a deeper tone; the petals are broad, measuring three-quarters of an inch in width, the edges closely set with numerous hairs, becoming very dense at the base, the whole a rich sherry-brown. The pouch closely resembles that of C. Harrisianum, and is of a rich deep purplish brown. The plant partakes of the character of both parents, having charming tessellated foliage. It has been named in honor of Mr. J. Morris, who has charge of the valuable collection of Cypripediums owned by Hicks Arnold, Esq., of this city. It flowered for the first time in F. Sander & Co.'s nursery, St. Albans, England.

New York. *A. Dimmock.*

Correspondence.

Some Rare New Jersey Plants.

To the Editor of Garden and Forest:

Sir,—Lygodium palmatum, the lovely and somewhat rare climbing Fern, was known to grow in quite a number of localities in this state at one time. Many of these Ferns are now destroyed. In the fall of 1894 I rediscovered the plant near Haddonfield, Camden County. It was growing abundantly among the Alders and Cornels that fringe a small brook, climbing to a height of four feet. It is very graceful and delicate in appearance, but the abundant growth indicated that it was perfectly at home.

Arenaria lateriflora is found quite abundantly on the sand-hills below Atlantic City. Some of the dunes have a complete carpet of green formed of its trailing stems and foliage. The fact of its being evergreen was unknown to me until this winter, when, having occasion to use some of the plants, I visited the locality (about one mile below Chelsea). I was at once struck by its beauty and adaptability for planting under trees in exposed sandy seaside places. It blooms quite freely in spring, the small white flowers resembling some of the Stellarias.

A rare and very peculiar plant is Clitoria Mariana. It appears in isolated places many miles apart, sometimes diligent search failing to reveal more than a single plant. I have always found it on quite dry sandy land.

Desmodium rotundifolium is a very ornamental trailer as it grows here. The habit of the plant is entirely prostrate, the large, perfectly round green leaflets covering the ground completely. It seems to thrive under trees where the shade is very dense, and I have often found it in full exposure. A single plant often covers a space two feet across.

Hammonton, N. J. *F. L. Bassett.*

More About Choke Cherries.

To the Editor of Garden and Forest:

Sir,—I was very much interested in the letter of Professor Card which appeared in your issue of February 3d, on "The Choke Cherry in Cultivation." I send you this note to corroborate the statement of Professor Card, and to say that in the clay flats of the Province of Quebec, bordering the Richlieu and St. Lawrence rivers, the Choke Cherry is one of the principal fruits cultivated by the French habitant. This is owing largely to the character of the soil, which is of the pronounced blue-clay stamp and of the stickiest and most impervious type. In this region the Choke Cherry may be found in almost every French garden. It is cultivated mostly in tree form, and multiplied by means of the suckers which spring up about the roots. A great many variations occur. Fruit large and small, light and dark, astringent and non-astringent, may be found. Two years ago I found a tree bearing large clusters of yellowish white cherries. I have sown the seed of these and am watching the young seedlings with interest, hoping that improved forms may appear. The French use this fruit in many ways, but it is most largely partaken of uncooked, next as preserves, while a smaller proportion is made into jelly. The tree is hardier than the Wild Black Cherry, Prunus serotina, and is found all through the north-west territories, even upon elevated portions of the foot-hills of the eastern Rockies.

Central Experimental Farm, Ottawa, Can. *John Craig.*

Meetings of Societies.

Western New York Horticultural Society.—II.

WE conclude our report of this meeting of fruit farmers by giving the principal points in two other addresses:

THINNING APPLES.

This was the theme of Professor S. A. Beach, and a timely one, since the overwhelming crop of the past year has seemed to some growers as much of a calamity as the attacks of fungous diseases or the ravages of insects. Since prices for the crop did not cover the cost of packages and the labor of picking and handling the fruit, Professor Beach argued that it would have been good economy to have thinned the crop so vigorously as to reduce the total yield and increase the amount of fruit of the first quality. This is not merely a theoretical view, since some tests conducted by the Geneva Experiment Station, in Ontario County, indicate that, besides relieving the market of inferior fruit, thinning has a marked influence on the productiveness of the trees in succeeding years. In these tests trees of the same variety as nearly alike in all respects as possible were paired for comparison, the fruit on one being thinned and the other left untouched. The thinning was tried in three ways: (1) all wormy, knotty and inferior fruit was removed and all clusters reduced to one apple; (2) in addition to this fruit-culling the remaining fruit was once more picked over, so that the apples left were not less than four inches apart; (3) same as the first treatment, with the remaining fruit thinned to leave apples not less than six inches apart. Trees of Baldwin Apples treated by the first method gave sixteen per cent. less fruit of all grades, and ten per cent. more fruit of the first grade, than the corresponding trees not thinned. Under the third method Hubbardston trees gave twenty-five per cent. less fruit, but seventeen per cent. more first-grade fruit. Greenings, which were heavily loaded in 1895, bore a good crop in 1896, but were not overburdened, and needed comparatively little thinning. Under the second method they gave six per cent. more fruit and ten per cent. more first-class fruit than unthinned trees. In all these tests about one bushel of culls was found on the trees, which were thinned to three bushels where the fruit was not thinned; while in all grades the thinned fruit was clearly superior in size and color to fruit of the same grade not thinned. The first grade included no apple less than two and a half inches in diameter, and the proportion of the apples which measured above two and a half inches was much larger where the fruit was thinned than where it was not, so that No. 2 apples from trees that were thinned were superior to the same grade from the trees not thinned. It was estimated that the fruit from the trees picked over would bring from ten to fifteen per cent. more in market than the same grade from trees which had not been picked over. Taking these results, the second method of thinning was enough superior to the first to more than pay for the extra work involved. Accurate data for comparing the second and third methods are not at hand.

It is too early to report precisely the effect of this treatment on next season's crop, but the experiment shows a marked improvement in the size and color of the fruit where the overloaded trees were severely thinned. These results are not surprising, and the experiments were hardly necessary to demonstrate them. The questions which remain to be determined are (1) whether it is possible to so control the productive energies of Apple-trees that they will usually bear every year rather than every alternate year, or even less frequently; and (2) if so, whether the results will warrant the expense of the extra work involved. It is well known that the thinning of peaches and pears makes a marked difference in the size, color and quality of the remaining fruit, and there is no doubt that apples on an overloaded tree cannot mature so great an amount of large, well-colored fruit as one which bears a moderate crop under the same conditions. The production of a great proportion of very large fruit seems to depend on the ability of the tree to furnish nourishment to the individual branches or fruit spurs.

The tree may be looked upon as a machine for manufacturing plant substances out of crude materials obtained from the soil and air. The work is done in the green portions of the plant, almost wholly in the leaves. In the presence of warmth and sunlight the crude material enters with the sap through the root, rises to the leaves, and with other material taken from the air it is built up into starch, sugars and other compounds which go to sustain the life and the growth of the plant. The total amount of such product which a tree can manufacture in a season is largely determined (1) by the amount of available plant-food in the soil, (2) the amount of foliage which continues healthy and vigorous throughout the season, (3) the total amount of sunlight and temperature favorable for the growth experienced during the season, (4) by a certain factor which may be called individual capacity and vigor of the tree. The amount of food material which a tree can supply in a given season for growing a crop of fruit is therefore largely fixed by the conditions last named and the amount of reserve material which was stored up in the tree the previous season for future use. After an Apple-tree has reached maturity the forming of fruit-buds during the latter part of each season is a perfectly normal process which will take place whenever the tree has sufficient nourishing material to supply this demand in addition to sustaining its growth, ripening its wood and providing leaf-buds for the coming season. The fruit grower may provide to some extent for the formation of fruit-buds each season by directing to that end the favoring influences so far as they are under his control. The foliage may be protected from attacks of disease and insects by spraying, so that it can elaborate the food material essential to developing the various plant tissues. By tillage and fertilizers enough plant-food in readily available form can be provided in the soil. By judicious pruning the amount of bearing wood may be regulated so as to reduce the labor of thinning the fruit, and sufficient light may be admitted to the inner and lower branches to help the leaves in manufacturing substances essential to the growth of fruit. Finally, by thinning the fruit so as to prevent the prodigal waste of the resources of the tree in seasons naturally favorable to excessive yield, the trees may be brought into more regular bearing, and in the end a much larger amount of first-class fruit can be produced. It may be objected that it is impracticable to thin apples because the fruit does not ordinarily bring a sufficiently high price to cover the cost of extra labor, and this is perhaps the most serious objection to the practice which presents itself to practical growers. Questions as to the best way of doing the work must be settled by practice in accordance with local conditions. Mr. Charles A. Green has written to *The Rural New-Yorker* that he took off from one-third to one-half of the fruit on a tree in a short time with an ordinary steel garden rake. Mr. T. Greiner has suggested in the same paper the shaking off of fruit and whipping it off with long poles. Both men admit that these methods are crude, and, no doubt, they suggest them simply because they are inexpensive. They are objectionable because no discrimination can be used as to the kind of fruit which is removed. Besides this, they cannot be used in June when the largest apples are no more than an inch and a half in diameter and the trees must, therefore, carry their full burden till later in the season before the fruit is large enough to be raked, clubbed or shaken off. The energies of the tree are thus wasted, and the fruit which is left cannot be expected to show as great an improvement as when thinning is done earlier in the season. More careful methods must eventually be adopted before thinning becomes an established practice.

It is well known that the lower branches and shaded parts of the tree bear a larger proportion of fruit inferior in color, size and quality than the branches which have more light. Most of these lower branches may usually be reached from step-ladders or racks fastened on wagons so that the parts of the tree which most need to be thinned can be reached with comparative ease. It would seem that by some such method a large part of the thinning could be satisfactorily done with cheap labor under experienced supervision. It should be remembered that the increased value of a crop is not the only item to be credited to the practice of thinning. It costs considerable labor to prop the branches of trees and save them from breaking under excessive burdens, and this goes to counterbalance the expense of thinning. Besides this, in an unthinned crop a large amount of inferior apples must be handled at little or no profit, or possibly at a loss. The ripening of this inferior fruit practically shuts out the possibility of a crop the next year. Looking over the season of 1896 we see broken trees and broken prices. Looking forward to the season of 1897 we see barren trees, with prospects of good prices. And after all the labor the late great crop has imposed, and the loss it has brought to many fruit growers, is it not worth inquiring whether the thinning of the fruit in 1896 would not have paid? Would it not have been better if half the second-class apples grown in New York had never been marketed? If throughout the apple-growing sections half the seconds and all the culls had been thinned out early in the season, the remaining crop would have been exceptionally fine, and New York would have sustained the reputation for fine apples, which would be a material help in marketing succeeding crops. Besides this, having exceptionally healthy foliage and a favorable growing season, it is reasonable to expect that the partially unburdened trees would have provided fruit-buds for at least a fair crop next year.

PLANT-FOOD IN SOIL.

Professor Roberts read a paper entitled "An Inventory of the Land," which was a study of the productive power of soil. From a number of analyses he found that, on an average, eight inches of surface soil contained of potential plant-food to the acre 3,053 pounds of nitrogen, 4,219 pounds of phosphoric acid, 16,317 pounds of potash. This means so large an amount of the necessary elements of plant-food that one wonders why we do not secure larger crops and why we need to manure the land. Of course, with our present methods of tillage a very large percentage of this plant-food is not available, and the problem is how to treat this dormant food so that it can be used by the growing plants. The first consideration which impresses Professor Roberts is that it is not lack of food in the soil so much as lack of moisture which causes plants to languish. The prime object of successful tillage then ought to be to make the land a reservoir for the storage of moisture and to so treat it by stirring the surface as to prevent its evaporation, or, in other words, to compel it to pass off through the plants and do its work in supplying them with food. A number of experiments made during 1895 and 1896 on land of light and gravelly texture in cultivation without the use of any fertilizers seem to prove that large crops of potatoes, say 350 bushels to the acre, could be grown by cultivating between the rows so frequently as to pulverize the soil and liberate the plant-food. Of course, if there had been more rain there would have been better crops, but the tests seem to show that the soil could be so worked as to release as much plant-food as the crop could digest. At all events, it is Professor Roberts' belief that there is enough inert plant-food in the soil which can be made available by a little extra expense in tillage and cultivation, and that by the same method in ordinary seasons enough water can be preserved in the soil to develop a paying crop.

Notes.

During the first week of this month 47,000 bunches of bananas were received at this port.

During the fiscal year ending June 30th, 1896, 376 publications were issued by the United States Department of Agriculture. Exclusive of reprints these publications comprise 10,170 pages, and the total number of copies of all of them was 6,561,700.

At the more elaborate dinners and balls given by wealthy society people this winter the chief decorations have been of costly Orchids interspersed among the fronds of Adiantum Farleyense. *The Florists' Exchange* tells of one dinner table laid for thirty-two covers which was decorated with five hundred flowers of Cattleya, 2,200 of Dendrobium and 200 spikes of Lælia anceps, laid in a foundation of Adiantum Farleyense.

The new white Rose, Lillian Nordica, for which Mr. M. H. Walsh, of Woods Holl, Massachusetts, received a certificate of merit from the Massachusetts Horticultural Society last year, was exhibited at a recent Saturday meeting of the same society in Boston and attracted great attention. The flowers have long, straight stems, rich dark green foliage and exquisite fragrance. The seedling blooms freely and is from Margaret Dickson crossed by Madame Hoste.

As we stated last December, Albemarle Pippins have been uncommonly scarce this season, the entire crop in Virginia amounting to but 1,000 barrels. Most of the single car-load of this fruit which came to this city was exported, but the English supplies of this favorite apple have been mainly of the similar Newtown Pippins, from the Hudson River district in New York state. Five car-loads of Newtown Pippins recently reached this city from Oregon and California, and these, carefully repacked in boxes holding a bushel, have been shipped to London, where they have been pronounced the best apples of the kind seen there this season. They have realized as much as $5.50

a bushel, a remarkable price in any season, and especially so when nearly two and a half million barrels of apples have been exported to Great Britain from the United States and Canada since last August, and with the best Baldwin and other standard varieties selling in England now for $2.50 to $4.62 a barrel.

At the recent conference on the occasion of the tercentenary of the introduction of the potato Professor Johnson spoke of the value as a substitute for the potato of Stachys tuberifera, a vegetable which is growing in favor in England, France and Switzerland. Somehow American gardeners do not seem to take much interest in its cultivation, although it contains eight times as much nitrogen as a potato of the same weight and a large quantity of a carbo-hydrate called galactan, which is more digestible than starch, being allied to dextrin, and therefore more easily converted by the digestive juices into sugar. For this reason the tubers of this plant would be especially useful for invalids and persons of delicate digestion, since they bear the same relation to the substance of the potato that peptonized foods do to ordinary meats.

Tests made in California as to the shrinkage of different varieties of prunes show that the small French prunes, thirty of which weigh a pound when fresh require seventy-five to the pound when cured, in round numbers, or, more accurately, the weight of the fresh prunes is to the weight of the prunes when cured as 253 to 100. In the large French prunes the ratio between the fresh fruit and cured fruit is as 291 to 100. Of the Robe de Sargeant variety the ratio was 278 to 100, while the ratio of the so-called Imperial prune of France was practically the same as that of the small-sized French prune, namely, 253 to 100. This Imperial prune is a trade name of a very fine French product, and the only variety which comes up to the standard is Imperiale Epineuse. This variety has but recently been introduced into California orchards, where it has proved of the very first quality. The leaves of the tree endure dry weather well, but it has not been planted long enough to demonstrate that it will be productive.

Some experiments recently made at the Massachusetts Agricultural College by Mr. Asa S. Kinney seem to show that a current of electricity will accelerate the germination of seeds. In a collection of seeds treated for twenty-four hours, thirty per cent. more germinated under the current than in lots untreated, and the seeds which received the electrical stimulus gave a higher percentage of germination than others. In many cases electricity seems to act a good deal like light does in its stimulating effect. It must be understood, however, that even if we admit this we do not know the best methods of using electricity upon plants in the soil, nor what strength of the current will probably secure the greatest growth. The range and the strength of the current which accelerates germination is found to be exceedingly limited. So far as these experiments go to form a basis of judgment, it would appear that the strength of the current which shows the greatest growth of radicles is equal to about three volts, where an interrupted induced current is used.

In the past two or three years not a few figs carried over by wholesale dealers until August, when they have become dry and unsalable, are then dipped into a thin syrup to freshen them. They are packed in fancy splint baskets holding a pound or more, enclosed with a muslin cover sewed on the edges, and alluringly stamped "Turkey." If sold at once before the arrival of the new crop and while yet in good condition, they are satisfactory to the uninitiated housekeeper, and are really rather improved by the harmless process. They are mostly sold by grocers and at second-class fruit-stands, and cost twenty-five cents a package. Kept too long they become moldy and musty. Recently a similar process seems to have been applied to a limited quantity of presumably new-crop figs, the fruit being then readily drawn out into its natural form, and labeled "pulled figs." These have been sold at the exorbitant price of fifty cents for a neatly packed box holding less than a dozen and a half of the fruits. In this case there is no good reason for the freshening, since the new-crop fruit still retains its own juices, and the effect is to make it bitter and not at all the delicacy it affects to be.

A Chicago florist has been selling fine Freesias with straight, stiff stems from eighteen to twenty inches long, and large, erect flowers, at $3.00 a dozen, while the common run in the market are hard to dispose of at $2.00, and sometimes at $1.00. These Freesias come from the stock of ten years ago, when the flowers first began to attract attention, and the bulbs are better than when they were first obtained. Ten or twelve are planted in a seven-inch pot, and after the flowering period is over the foliage is allowed to die off naturally, and then the plants are treated like Callas, being allowed to die down every year. When there is no longer any growth the pots are set under greenhouse stages and kept perfectly dry. About the first of August the bulbs are sifted from the earth and selected into sizes, and those of the same size only are placed in the same pot. For years they have come into flower about Christmas or New Year's, and by being placed in heat in succession they bloom until the end of February or the middle of March. Certainly this care is well repaid, and, cheap as Freesia-bulbs are, the purchase price is saved, and the bulbs are always on hand for early planting, which, after all, appears to be important for their successful growth.

Oranges from Cuba now sell at $6.00 a barrel, wholesale, repacked. While very sweet, this fruit is not at all showy or attractive, the skin being coarse and dull-looking. The Havana fruit also has poor keeping qualities and must be sold soon after landing and used within a fortnight. The season for Jamaica oranges is almost ended, but 250 barrels having been received here during last week. Altogether, 254,080 barrels and 23,340 boxes of this fruit have come here since the first importations last September. But these heavy shipments have been carried on with very little profit to steamship lines and importers, and in some instances at considerable loss. Of 35,000 barrels of oranges which came from Jamaica in one week early in the season, all of the fruit was unripe and half of it spoiled from being gathered during rains and from careless packing. This want of care and judgment in picking, packing and shipping is said to be the cause of an unprofitable season when the outlook was highly favorable, owing to the scarcity of Florida oranges. The season for the latter is also closing; the best now sell for $5.00 a box, at wholesale. Washington Navel oranges, from California, are the showiest of all citrus fruits now seen here, and are especially bright and clean; $3.50 a box, at wholesale, is a fair price for this choice fruit, which is juicy and sweet. Of Mediterranean oranges, good Valencias sell for $2.65 and Sorrentos for $2.15, prices on Mediterranean oranges and lemons having advanced fifteen to twenty-five cents a box during last week. There are now 20,050 boxes of these oranges and 147,000 boxes of lemons on the way to this port. Grape fruit from Jamaica costs $6.00 to $10.00, and from Florida $12.00 a box, at wholesale,

Dandelion is now coming from the meadows of New Jersey and from under glass, the forced plants being more luxuriant in growth, though not more tender. Both sell for fifteen cents a quart. Other offerings in collections of fresh vegetables are spring onions and leeks, chives in little clumps of soil, endive, chervil, fetticus, watercress, mint, escarole, tarragon, parsley and sorrel. Well-grown shoots of rhubarb cost ten cents for a bunch of seven; Boston cucumbers, twenty-five cents each. Okra, from Cuba, costs ten cents a dozen, and peppers five cents apiece. Short plants of celery, from Rochester, New York, sell for seventy-five cents a dozen, and the longer ones, from California, beautifully blanched, for $1.00, while the new crop from Florida commands $1.50. The best cauliflower now comes from Florida, large perfectly white heads costing thirty-five cents each; those from California are yellowish after the long journey, and find slight demand. Large quantities of spinach and kale have been coming from Norfolk, Virginia, one steamer last Saturday bringing 1,400 barrels of spinach and 600 of kale, and the receipts of these two vegetables for the week amounted to 11,050 barrels. These sell at twenty cents a half-peck. Florida tomatoes cost twenty cents a pound, and those from northern hot-houses forty cents. String-beans are quite plentiful at twenty cents a quart, while southern peas are scarce, and some from California have sold at $1.50 a half-peck. Bright, fresh eggplants cost twenty cents each, and new beets and kohl-rabi, four in a bunch, ten cents, and among winter roots oyster plant and knob-celery may be had for the same price. Winter beets, carrots, turnips and parsnips are in regular supply. Cabbage, from Long Island, costs ten cents a head, and the red sort brings fifteen cents. There is also Danish cabbage in market, and new cabbage from Florida. Lettuce is coming from Boston hot-houses and from Florida and Cuba, and Romaine lettuce from Bermuda. Onions, from Bermuda and Havana, bring thirteen cents a quart. Bermuda potatoes sell for fifty cents, and sweet potatoes, from southern New Jersey, for twenty-five cents a half-peck. Mushrooms continue abundant, the best costing but fifty cents a pound. Hot-house asparagus is still a luxury, and commands ninety cents for a small bunch.